



Intelligent Mobile Sensor System (IMSS) For Autonomous Monitoring & Inspection



Developer: Lockheed Martin

Contract Number: DE-AC21-92MC29112

Crosscutting Areas: Robotics & CMST

Mixed Waste
FOCUS AREA

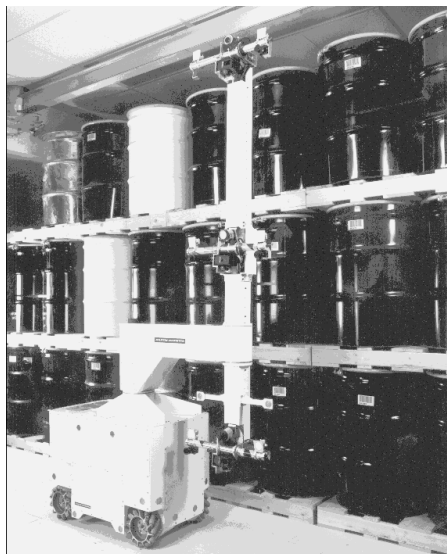
Problem:

Current methods for inspecting and monitoring stored waste requires personnel to walk through the storage area with various instruments or rely on passive monitoring. Public and occupational health risks are involved with these techniques, along with high costs and environmental risks. Passive detectors rely on fixed sensors dispersed within the containment building. If leaks occur operators must enter the area and locate the leaking container. Extended exposures during normal inspection can add up quickly causing concern for human health.

Solution:

A mobile robotics device with enhanced intelligence and dexterity has advantages in reducing risks and costs. The Intelligent Mobile Sensor System (IMSS) is capable of operating in narrow aisles and interpolating the free aisle space between rows of stacked drums. It uses an integrated sensor suite for leak detection, and interfaces with the site database for inspection planning, data correlation, updating,

and report generation. The robot would be capable of departing on an assigned mission, collecting required data, recording which portions of its mission had to be aborted or modified due to environmental constraints, and reporting back when the mission was completed.



Benefits:

- Detecting drum location, surface dents, and drum tilt
- Detecting rust, corrosion, fluid, or other defects
- Detecting, reading, and verifying labels

► Human and environmental risks lowered

Technology:

The key technologies in IMSS are the inspection sensors, the autonomous navigation system, and the integrated database system. The required inspection platform is similar to a science mission in that it must gather, store, and correlate data. The sensor systems to be used include commercial components as well as derivatives of those designed to survey the Martian surface from a rover (miniaturized to fit on a vehicle and with a computer interface).

The tasks of initially locating the drums, detecting surface dents, and measuring drum tilt are essentially three-dimensional tasks, requiring accurate measurement of three dimensional points on the surface of the drums. Active vision techniques using structured light or laser ranging are better for cost and performance. Two reasons for this are: 1) the majority of the drum surface is visually smooth and featureless and 2) stereo vision algorithms typically are much more computationally intensive and less



The IMSS will be one of three drum inspection technologies to participate in a "bake-off" among similar and competing technologies. The other two systems are the Automated Baseline Change Detection (ABCD) System (also developed by Lockheed Martin) and the Intelligent Inspection and Survey Robot (ARIES, developed by the South Carolina Universities Research and Education Foundation).

Robotics and automation have been core technologies at Lockheed Martin for its aerospace and defense activities. Lockheed Martin is actively applying this technology base to DOE's needs. For information regarding this project, the contractor contact is:

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